FRUIT JUICE MATTERS
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Fructose and 100% fruit juice

'Sugars' is the group name for glucose, fructose, lactose and sucrose. All fruits naturally contain sugars, including fructose, which is why this type of sugar is found in 100% fruit juices.

The amount of fructose in fruit juices varies from 0.5 to 7g per 100g and is similar to what you would see in the whole fruit per 100g. A 200ml glass of orange juice provides around 6g of fructose which is well below the levels considered to have adverse effects on health.

Fructose metabolism

Unlike glucose, the absorption of fructose from the gut does not require insulin release. It is completely metabolised in the liver, where it is rapidly broken down in the glycolytic pathway and then in the Krebs cycle. Any excess energy from fructose (as with other sugars) may be converted into glycogen, lactate and fatty acids[1].

Fructose content of whole fruits and juices

The fructose content of a portion of fruit can vary significantly depending on the type of fruit as well as pre- and post-harvest treatment[2]. On average, a portion of fruit contains about 6g fructose which is similar to that seen in a portion of 100% fruit juice. Fructose content is lower in citrus fruits (0.5-2 g/100 g) and pineapple (2g/100 g) and higher in apples and pears (more than 6g/100 g); these differences are reflected in the respective fruit juices. If the fructose component of sucrose (glucose+fructose) is also taken into account, the amount of fructose in a portion of fruit varies from 1 to 6g for citrus fruits, about 7g for pineapple and 10g for apples and pears, while in fruit juices the fructose content is 1 to 6 g for citrus fruits and 11 to 15 g for pineapple, apple and pear juices[3] These compositional data translate into a fructose energy contribution that varies from 0.2 to 2% for fruit and 0.2 to 3.1% for 100% fruit juices, against a Reference Intake of 2000 kcal/day.

Per 100g	Whole orange	Orange juice	Whole apple	Apple juice
Fructose	2.0	1.7	6.6	5.5
Sucrose	4.3	2.7	2.1	1.0

Fructose consumption from fruit juices

Based on data from the INRAN-SCAI investigation in 2005[4], very little fructose is consumed from fruit juices, and intakes are comparable to, or lower than, the fructose contribution of whole fruits. Based on average fruit juice consumption data in 46 different countries[5], an

average intake of 1.5g fructose from fruit juices was reported, which corresponds to less than 0.5% of the total calories in a 2,000 kcal diet.

Potential adverse metabolic effects

In recent years, attention has focussed on the possible relationships between excessive dietary sugars, fructose in particular, and the dramatic increases in obesity, diabetes, metabolic syndrome and cardiovascular diseases.

The mechanisms typically proposed for adverse metabolic effects relate to the triggering of hepatic *de novo* lipogenesis, the promotion of hepatic and extra-hepatic insulin resistance, hyperuricemia and oxidative stress[6,7]. A recent meta-analysis considered the effects of high doses of fructose on post-prandial triglycerides[8]. In trials where excess calories were given (hypercaloric diets), there was a significant increase in triglyceridaemia compared with a basic diet (in these trials the fructose intake was around 175g/day, equal to 25% excess energy). However, in the trials where calories were balanced (isocaloric diets) no significant effects were seen (average fructose intakes < 20% daily energy). This suggests that the issue of high post-prandial lipids is caused by excess calories, not fructose specifically.

Neither does fructose appear to cause weight gain when replacing other sugars in isocaloric quantities, although consumption of high doses which provide excess calories may cause an increase in body weight[9]. Evidence has shown that the acute administration of small fructose doses (<10g in a meal) attenuates the glycaemic response to glucose loading by 14% in people with type-2 diabetics and 19% in healthy subjects[10]. It is likely that adding fructose to the diet promotes glucose tolerance by triggering net liver uptake of glucose.

A meta-analysis from 2012 found no increase in systolic or diastolic blood pressure associated with high fructose consumption[11]. A UK expert panel report on Carbohydrates[12] found no consistent evidence suggesting adverse metabolic effects for fructose. It also noted that high-fructose corn syrup, much maligned as a sweetener in the US, is not commonly available in Europe due to strict quotas.

Conclusion

The fructose content of 100% fruit juice is similar to the fructose content of the fruit from which it was made. People obtain more fructose from whole fruits in their diets, than they do from 100% fruit juices. Studies looking at the health impact of fructose have not found any consistent evidence of harm when energy intakes are in balance with expenditure and the fructose comes from natural sources.

References

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